

SURGERY OF THE TONGUE.¹

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IN THE following paper on the "Surgery of the Tongue" I shall confine myself to a discussion of operative procedures in malignant disease, and it may be well to first briefly review our knowledge of lingual cancer. This can be the more satisfactorily done as there is agreement in the main by most authorities upon all the essential points. With scarcely an exception, cancer of the tongue appears in the form of an epithelioma. It affects males more frequently than females, it occurs most often between the ages of 40 and 65, and is more frequently situated upon the edge than the dorsum, and on the right than on the left side. It generally implicates the neighboring glands but is seldom followed by metastatic deposits. It runs its course in an average of about a year and a half, and tends to a fatal termination by exhaustion from repeated hemorrhages, inability to take sufficient nourishment and from the swallowing of contaminated discharges, and from pneumonia or septicæmia. In a large proportion of cases it develops from an indifferent lesion which has been subjected to some form of continued irritation, and in only a limited number of cases can it be traced to any previous cancer in the family. The growth most frequently occupies the surface of the tongue but may occur in the form of an interstitial growth; ulceration in both forms occurs early. In the Middlesex Hospital Report for 1888, all the cases of cancer which had been admitted for the previous seven years are carefully analyzed;—744 in all. Of these, 135 affected the tongue or mouth,—the uterus and breast being alone attacked more frequently—122 were males, and 13 females. The youngest case was 25 years old, and the oldest 78. Eighty-two per cent. of all the cases were found between 40 and 65 years. The average duration of life in twenty-nine cases which ran their course without operation was 18 4-10 months, from the time the

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disease was first noticed,—the shortest time was 5 months, and the longest 53 months. In thirty-three cases in which the tongue was removed the average duration of life was 19 1-10 months, the longest 79 months. These figures coincide very nearly with those of Woelfler, who claims that statistics show a clear gain of six months of life in the cases operated on. In the thirty-three removals in which a fatal termination ensued the average duration of life after the operation was 8 9-10 months, the longest time was 39 3-10 months. It is to be remembered that these results represent the work of a number of different operators and a variety of methods. In the table of treatment the operations tabulated are excision with knife, excision with scissors, removal with wire ecraseur, and those destroyed by the actual cautery. A comparison with the work of recent individual operators will be made later. The situation in one hundred male cases was noted as follows :

Right edge, (middle 12, base 9),	25
Left edge, (middle 9, base 5),	18
Cheek,	10
Floor near frænum,	21
Dorsum,	4

Here again we find an agreement with Woelfler. The mode of origin is given as follows ;

Sore, crack or ulcer,	65
Hard lump or nodule,	18
Pimple,	5
Warty growth,	3
White speck,	3
Fungus outgrowth from socket,	4
Boil and blister,	2

In 52 per cent. of all the cases there was a history of some previous injury or disease. 81 cases were assigned to injury ; in 28—22 were due to irritation by bad teeth and 6 to other causes. 70 cases gave a history of disease of the tongue or mouth in 32, syphilitic lesions in 14, chronic superficial glossitis 3, ichthyosis 14, and a wart in one case. In 29 out of 80 cases there was distinct evidence of syphilis. Only 6 out of 70 cases had never smoked, 41 had been great smokers, and 23 moderate smokers.

The evidence here presented of a precancerous stage in a large proportion of cases of carcinoma of the tongue is in entire accordance with the views of modern writers who, apparently without exception, enforce the frequency with which indifferent lesions may undergo cancerous degeneration. The frequency with which which syphilitic lesions of the tongue undergo a transformation into cancer has been emphasized by Fournier, Hutchinson, Butlin and others, and these lesions are now generally admitted to precede the cancerous growth in a large percentage of cases. The conditions which are commonly described as chronic glossitis, chronic superficial glossitis, psoriasis, leucoma and ichthyosis, are now considered almost without exception to have an important etiological effect in the production of lingual cancer, and the above figures given from the Middlesex Reports are so fully borne out by general experience that the existence of a precancerous stage in a large proportion of lingual cancers may be considered as definitely established, and to the above may be added the irritation of bad teeth, the continued cauterization of sores, "spirit drinking, smoking and rough eating," the latter of which probably go a long way in explaining the greater frequency with which the male sex is affected. The family history shows that in 64 cases where the facts were known 59 of the fathers were dead. In 30 where the cause of death was known none were ascribed to any form of cancer, but 9 were due to consumption, or 30 per cent. Of the mothers there were two cases of cancer, uterus and breast each one, and 2 due to consumption out of 29. In 75 families phthisis was found among the brothers and sisters in 20. The frequency of phthisis and infrequency of cancer in the families of those affected with cancer of the tongue is a noteworthy fact, and supports very strongly the view that lingual carcinoma is at first a local affection. In 34 cases of recurrence the average time after operation was five months, the shortest 2 weeks and the longest 52 months. 22 of the cases recurred in the cicatrix at the primary seat, and 10 in the adjacent glands. Above 30 of the 32 cases recurred within a year. The figures above given are in marked contrast with the experience of Hutchinson given in a recent lecture in which he states in justification of partial excision that in only four cases did recurrence take place within the month. The figures given in the Middle-

sex Report as to the condition of the lymphatic glands are of especial importance. In 94 primary cases there was an obvious enlargement in 78, or 83 per cent. In the remaining 16 there was no enlargement discovered. The following glands were affected:

Right side of neck (chiefly submaxillary),	28
Both sides, ...	17
Left side (chiefly submaxillary)	16
Sub-mental	5
Left and sub-mental	3

Verneuil has pointed out that the lymphatics in three different localities may be affected and that these regions should always be examined in cancer of the tongue—the submaxillary—the supra-hyoid and the glands over the parotid sheath. Hutchinson says: "The gland affections may occur in any one of several regions. The commonest part is in the floor of the mouth. A second is under the anterior edge of the sterno-mastoid; where if it is single it is easily accessible, but not infrequently several glands surround and are adherent to the sheaths of the vessels. The worst position of all and not very infrequent, is behind the mastoid process and the upper part of the sterno-mastoid." In 52 autopsies on cases of cancer of the tongue the adjacent glands were involved in every case except one, and in 30 both sides were affected. It is generally admitted that metastatic deposits do not often occur. Woelfler asserts that where the growth is confined to the tongue itself the glands behind the angle of the jaw are most likely to become infected while if the floor of the mouth or sides of the cheek, the submaxillary glands. In these cases metastatic deposits were found seven times, both lungs and liver twice, both lungs twice, liver, mesentery glands, and left kidney each one. The causes of death in 51 cases not operated on are given as follows:

Asthenia, ...	31
Catarrhal Pneumonia	6
Phthisis, ...	4
Gangrene of lung, ...	3
Oedema glottis, ...	3
Secondary disease in Thorax and Pulmonary Con- gestion, each.	1
Syncope, ...	2

The time and circumstance of the involvement of the adjacent glands demands more study. They may remain free for eight or nine months, or may become infected within two or three. The tendency to more radical operation is certainly more and more evident, and it may be that future progress is to be made in the line of treating the submaxillary space in cancer of the tongue, in the same thorough manner as is now generally done with the axilla in carcinoma of the breast. Satisfactory exploration of minute glands is as difficult in one region as in the other. Death sometimes occurs from hemorrhage, but is much more frequently due to exhaustion brought on by repeated small losses of blood, by the inability to swallow a sufficient amount of nourishment, and by the deleterious effect of foul discharges which constantly find their way into the stomach or lungs. A condition of septicæmia hastens if it does not directly determine death in a number of cases. It is not my purpose to discuss the diagnosis of cancer. Other forms of tumor occasionally occur but so seldom that they may be left out of account, especially as removal by the knife is the only efficient treatment. Mistakes of this kind are only likely to occur when the growth is within the substance of the tongue. In ulcerated epithelioma the diagnosis will most often hesitate between tubercular and syphilitic ulcer. The latter, we have seen, is often transformed into a true carcinoma. Mistakes are undoubtedly often made, and Butlin quotes Nedepil as saying that the four tuberculous ulcers he had met with had all been cut out under the mistaken idea that they were cancer, and the diagnosis only made after operation. Bull has recently reported a similar instructive case. Frequent accounts of tubercular ulcer of the tongue are now met with in current literature—the diagnosis being verified and based upon the demonstration of the bacillus tuberculosis and it is not impossible that mistaken removals have taken place much more frequently than is supposed. It is not impossible that some of the more brilliant cases where life has been prolonged for many years may have been tubercular and not cancerous. A diagnosis of a tubercular ulcer of the tongue ought to be made by the discovery of the bacillus. I have recently had the diagnosis of a doubtful case thus verified, the bacilli being found in large numbers in the scrapings. It is said, however, that this search is not always

successful, even where the tubercular character of the lesion is undoubted. The mistake of a tubercular for a cancerous ulcer cannot, however, be considered a very serious one, for the complete removal of the former would here, as elsewhere, be the surest means of cure and the greater security against further infection. A less extensive operation, however, would probably be indicated in most tubercular cases. Syphilitic ulcers may occur as secondary or tertiary lesions—rarely a primary lesion. Difficulties of diagnosis are most likely to occur in cases of tertiary lesions. The presence of enlargements of the cervical glands is presumptive, though not positive evidence against the disease being syphilitic. Iodide of potash in sufficient doses will soon render the diagnosis clear, and should be energetically tried, but there is great uniformity in the advice given by most recent writers not to prolong the course if evident improvement does not occur in ten days or two weeks. Careful search for the bacillus and careful microscopic examination of a scraping of a sore for the characteristic cells of epithelioma should always be made, and if the examination is negative an anti-syphilitic course should be given. If this last is without effect after a reasonable time a free removal of the sore ought to be practised even in the absence of definite signs of cancer. Hutchinson recommends that the microscopic examination should be made after, and not before removal of the growth. Turning now to the treatment of cancer of the tongue the subject naturally divides itself into the operative or radical, and the palliative, indicated where the disease has passed beyond the range of surgical interference. Nothing short of complete removal can be considered as at all curative. Where the sore to be removed is limited in extent, whether distinctly cancerous or not, a large area of healthy tissue should always be taken away by a clean incision with scissors or knife; the removal of the entire tongue not being necessary in such cases. The advisability of bringing the edges of the wound in these operations together by sutures is answered differently by different operators. Where the tip or edge in its vicinity is the seat of disease a wedge shape section reaching well behind the sore ought to be removed. These partial excisions seem to give as great immunity from return as the removal of the whole or half of the organ. The operations are much less severe and

the function of the tongue in swallowing and speaking is better preserved.

Before entering upon a discussion of the operative procedures for the removal of the half or whole of the tongue which have received the sanction of experience and are now most in vogue, it will be of interest to briefly outline a history of the operation through its various phases of development up to the present time. The progress of development has been marked by a tendency to more and more thorough removal of all disease, but at the same time to a restriction of complicated methods, and to the adoption of simple procedures. Throughout this development the fear of hemorrhage, and the apprehension of blood gaining access to the lungs at the time, or subsequent to the operation, have been conspicuous and controlling features. The elaborate tables of Woelfler (*Archiv. f. Klin. Chir.* 81-82) have been the source from which subsequent writers have drawn their data for an historical review of the subject, and form the basis of both Barker's and Butlin's account. We may properly ignore the earlier operations dating back to Pimperlle in 1658, and the early attempts to destroy the disease by strangulation and consequent sloughing of the tongue by means of ligatures, and the barbarous procedure of circumpuncture with rods of caustic introduced by Girouard; and may omit the futile attempts to control the growth by ligature of the linguals, and commence our sketch with the operations which form the basis of modern methods and are still more or less employed.

Infra-maxillary Operations.—Regnoli, in 1838, removed the tongue by an incision reaching from the chin to the hyoid bone. This incision was enlarged by lateral incisions next to the chin, and the floor of the mouth opened, and the tongue removed by scissors after being drawn through the opening in the neck, and after hemorrhage had been provided against by a number of ligatures. It is worthy of note that Regnoli's patient was seated in a chair with her head resting against the breast of an assistant—a position which closely resembles the one now recommended by some of the most recent operators. The sub-mental or supra-hyoid operation was modified by Billroth by omitting the longitudinal incision and extending the cut below the chin further back on either side so as to make it available for the

removal of the glands, and the ligation of the sub-lingual artery. It was practised by this surgeon from 1871 to 1876, but given up on account of the great mortality—eight out of thirteen cases, or 61 3-10 per cent. During the same period his removals by the mouth showed a loss of 18 7-10 per cent. in thirty-two cases. A sub-mental opening into the floor of the mouth was utilized by Chassaignac, and has recently been strongly advocated by Barwell for the passage of the wire of the ecraseur. These methods are properly ecraseur operations and will be alluded to later. Kocher, in 1880, (*Deut. Zeitschrift. f. Chir.*, 1880,) published the account of his operation by a sub-maxillary incision after a preliminary tracheotomy, and with a complete clearing out of the sub-maxillary space with ligation of the facial artery on the side affected, and both linguals, if necessary. The tongue was removed through the opening in the neck by scissors or galvano-cautery. This method in his hands was followed by a single death in fourteen cases. Numerous operators have used and modified the opening from the neck for the removal of the tongue, and it has many strong adherents as being the only means of effecting a thorough radical operation when the glands are involved, for, as Verneuil has pointed out, even if the implicated glands are removed by an incision over them after the excision of the tongue, the intervening tissue containing the lymphatic channels through which the disease has spread is left behind and must endanger a further infection. Kocher's method has received general approval though considered too serious an operation for general use, and does not seem to have been largely used by any operator except its originator. The removal of the tongue by the ecraseur was first performed by Chassaignac in 1854, the wire being carried into the mouth by a puncture from the neck so as to embrace the better the base of the tongue. Its use has been strongly commended by a large number of eminent operators used either through an incision in the neck, or introduced by the mouth. Among those who have advocated its use and proclaimed its advantages may be mentioned Nunnely, ten cases and ten cures; Reid, four cases and four cures; Nottingham, Annandale, Kuester, Rose, Busch. Recently Barwell, has described a modified method of cutting through the base of the tongue by the wire introduced through

an incision in the neck, and completing the removal by a second *ecraseur* introduced through the mouth. The great advantage claimed for the removal by the *ecraseur* is that it is secure against primary hemorrhage. The *ecraseur* has played an important role in the removal of the tongue and is still employed and strongly advocated by not a few of the more prominent surgeons. Among these may be mentioned Bryant and Hutchinson, the latter of whom has recorded his views in its favor in a recent lecture (*Brit. Med.*, Dec., 1891). It has, however, decidedly lost ground in recent times, and some of the later writers condemn it in unmeasured terms. Treves says: "The instrument is barbarous and obsolete, and not in conformity with the principles of surgery. It represents the most slovenly and least efficient method of removing a part." While Whitehead asserts that "the wound left after the use of the *ecraseur* embodies every condition calculated to engender those putrefactive changes which it should be our primary aim to avoid—the erratic course of the *ecraseur* wire is absolutely beyond our control." The galvanic caustic loop introduced by Middeldorf in 1854, and at one time largely employed by Bryant, seems to have been practically abandoned, and is condemned by Woelfler as "most often followed by hemorrhage and no protection against wound infection and recurrence." According to this author, Just, in nineteen cases, had hemorrhage in ten; Angier, in forty-five cases, found primary hemorrhage in five, and secondary in eight; and Schlaepfer met with hemorrhage nine times in thirty. In this now very general disapproval of the use of the *ecraseur* wire an exception may possibly be made in favor of the method introduced by Morant Baker (*Brit. Med. Jour.* 2-765, 1883,) in which the tongue is split along the median line after being fully freed by scissors from the floor of the mouth, and then removed in halves.

Division of the lower jaw was first practised by Roux, 1836 (Butlin), subsequently by Sedillot and Syme. The operations of this latter surgeon have had a marked effect upon the surgery of the tongue among English speaking surgeons. Billroth modified the division of the jaw by practising a temporary resection of the body of the bone which was subsequently replaced and wired, but later this surgeon admitted the superiority of Langenbeck's

method of division of the bone and soft parts opposite the first molar. The experience of Billroth, however, is not favorable to the division of the jaw in removal of the tongue. In 12 cases he had 3 deaths, 3 recurrences, and one case free for two years after operation. The remaining five could not be traced. In the list of cases of excision and resection collected by Woelfler from various operators the same unfortunate result is to be seen. In 49 cases there were 17 deaths, or 34 per cent., and 14 recurrences of the disease. Anger has collected 20 cases of section of the jaw with 10 deaths. The conclusion which Woelfler reached was that section of the jaw in the removal of the tongue involves great danger, much discomfort and no better results as far as a radical operation is concerned. The advantages of section of the jaw have been recently again strongly advocated by F. Krause (*Deut. Med. Woc.*, May 30, 1890), where there is extensive disease of the tongue and mouth, based upon the statistics of Volkmann's Clinic, and it must be confessed his figures are most striking and fully justify his conclusions. In 35 operations there was one death from lobular pneumonia and one from causes not connected with the operation.

Division of the cheek in order to obtain freer access to the organ, was introduced to the English speaking surgeons by Collis in 1867, after first being practiced by Jaeger in 1831. It has received the approval of Butlin on diseases of the tongue, and has been commended by Fourniaux, Gant, Wagstaffe, and Rose. Jacobson considers "this step an excellent one," and Treves also seems to approve of it. Woelfler, however, says that it is unnecessary and far inferior to Kocher's method. Volkmann also condemns it. It must add to the discomfort, it certainly is permanently disfiguring, and in no way facilitates the removal of glands, and it would seem can be of advantage only in the limited number of cases where the disease is confined to the tongue situated far back, or when the jaws can not be sufficiently widely opened.

The advisability of the preliminary ligature of the lingual artery is still under discussion. Introduced by Mirault in 1833, it has been extensively practised and strongly advocated by Billroth, and recently by Treves in his work on Operative Surgery. The former surgeon considers that it is to be commended as a

rule. In 63 cases, in only 1 was there hemorrhage, and "as a rule, when both arteries are ligated, the muscles appear as bloodless as when an Esmarch bandage is applied to a limb." In Treves' experience of 34 ligations of linguals there was no hemorrhage. Jacobson and Whitehead both deny that it is reliable as a safeguard against hemorrhage, and to this Krause also agrees. In a personal case where the sublingual artery was ligated on account of a hemorrhage from a wound in the tongue, by a knife which had pierced the cheek, the hemorrhage recurred in 48 hours, and required a ligature of the external carotid. Hutchinson condemns it as unnecessary and as adding a complicated and difficult step to the operation. In this latter view I am inclined to think the majority of surgeons will agree.

Preliminary laryngotomy was advocated by Kocher in connection with his operation on the ground that it allowed of complete plugging of the pharynx during the operation, and so avoided the escape of blood into the trachea, and by breathing through the tube during the first few days the great danger of septic-pneumonia was avoided. This step has been highly commended by Jacobson, but it is generally condemned as adding an additional element of danger. It is wise, however, always to be prepared for tracheotomy in case it should become suddenly necessary. In removal of the tongue for limited disease, Pean uses hæmastatic forceps. One pair grasps the tongue transversely behind the growth. A second is applied in the median line, and a third grasps the tissues in the floor of the mouth. Spurting arteries are grasped by forceps, and a ligature applied, or the forceps left in place for 24 hours. This method meets the approval of Duplay in his recent surgery, but has not apparently been further adopted.

Finally, the simplest of all the procedures, the removal of the tongue through the mouth by means of scissors, was introduced by Whitehead, and has been steadily gaining favor ever since until it seems likely to supplant all other operations, either in the form suggested by the author, or some of the slight modifications advocated by other operators.

Removal of the tongue by scissors after ligature of the linguals was adopted by Billroth independently at about the same

time, after this surgeon had tried the instrumental incision, division and resection of the jaw, and splitting of the cheek, and his later operations have apparently been made by this method.

In this sketch of the operative methods for the removal of the tongue we may mention the suggestion of Heath to control hemorrhage by hooking the finger behind the base of the tongue, or stump, and drawing it forcibly forward; and the further suggestion of Treves for the same purpose of pressing forcibly with the fingers in the neck so as to make the floor of the mouth more prominent and bring the spurting arteries readily within reach. Jacobson has shown that the extraction of the incisors of the lower jaw facilitates all forms of operation through the mouth by enabling the operator to reach more easily the frenum and floor of the mouth. The attempt to cover the surface of the wound in the mouth by bringing together the mucous membrane over it was at one time practised by Billroth, but given up as causing great pain and swelling and increasing the distressing flow of saliva. It is now strongly advised by Pean, Duplay and Volkmann but does not seem to be generally adopted.

It remains now to describe more minutely the steps of the various procedures which at the present time are prominent candidates for professional favor, and to describe the results which have been obtained. Before, however, giving the details of the different methods we may adopt the propositions laid down by Treves as fully justified by the preceding discussion.

First. The organ should be removed by cutting either with scissors or knife.

Second. The removal should as a general rule be effected through the mouth.

Third. Every means should be taken to reduce the hemorrhage to a minimum.

Fourth. When the floor of the mouth is involved, or the glands extensively involved, the excision should be carried out through the neck.

The methods we shall describe are Whitehead's, Morant Baker's, Kocher's and Volkmann's.

The following account of Whitehead's operation is obtained from the *British Medical Journal*, May 2, 1892, in which his entire experience is embodied up to that day. A few days of

preparatory treatment is urged as judicious for the "purpose of generous feeding and more especially to obtain a cleanly condition of the mouth." Chloroform is used though no objection to ether is known. "The gag which secures the wide opening of the mouth must avoid pressing back the jaw so as to impede respiration. The patient is in a sitting posture with the head firmly erect with a slight inclination forward, in such a position that the light will fall well into the mouth."

To prevent the tendency of the patient to slip down "he should recline against an almost perpendicular back rest with the thighs bent at almost a right angle over the elevated portion of the operating table." A ligature is passed through the anterior part of the tongue and straight blunt pointed scissors are used for the section. "The two structures which are principally responsible for the retention of the tongue within the mouth are the frænum, and the anterior pillars of the fauces, and if these structures are completely divided the tongue can be so freely drawn from the mouth that the operation is converted into an extra-oral incision. The tongue is rapidly separated by cutting through these structures and the floor of the mouth," and instead of the cautious snipping originally advocated the author "now cuts boldly until within the immediate vicinity of the main artery disregarding all bleeding unless an artery distinctly spurts when it is twisted." "The more profuse the general bleeding," he says, "the more rapidly do I proceed, my object being to get as quickly as possible at the main artery as I have confidence that all subsidiary bleeding will cease immediately after their division. There is in reality no difficulty in determining the position of the lingual arteries as they are invariably found in the same situation and it requires very little experience to seize them with a pair of forceps before dividing them. If this is done there need not be the slightest hæmorrhage from this source. "When once the vessels are twisted the rest of the tongue may be removed without any further anxiety about hæmorrhage; but it is desirable before severing the last attachment to pass a loop of silk through the glosso epiglottidian fold as a provisional measure of security in case it may become necessary to make traction on the posterior floor of the mouth either to assist respiration or to arrest any possible consecutive hæmorrhage." This thread is a source.

of annoyance and is withdrawn within twenty-four hours, and has really only been of practical use in two cases. The cut surface is then rendered as aseptic as possible by swabbing the parts with a biniodide of mercury solution one part to one thousand and painted over with an iodoform styptic solution—friar's balsam—in which the spirits are substituted by a concentrated solution of iodoform in ether, one part in ten of turpentine having been added to the ether. This varnish is repeated daily. The patients are not confined to the bed but encouraged to walk out the day after the operation if there is sunshine and there is no "worse practice than keeping patients lying flat on their backs in bed." The average time of convalescence is seven days.

The scissors are preferred to the *ecraseur* "because they leave a clean cut surface instead of a bruised one, and further because with much greater certainty all diseased tissue may be removed." Whitehead has recently published the result of his entire experience in the removal of the tongue in part or in whole, one hundred and thirty-nine times. In the table given below 10 successful cases of removal by the galvano-cautery and 25 partial removals by scissors are excluded, and there remain 104 cases of removal by the method above described, with 20 deaths, or 19.21-100 per cent., or calculated upon the whole number, 14.3-10 per cent. When glands and jaw were involved, 77 per cent. and 57 per cent. respectively.

One hundred and four cases of excision of the entire tongue with scissors gave 84 recoveries and 20 deaths.

Excision through the mouth—79 cases.

Simply and uncomplicated—66 cases; 63 recoveries and 3 deaths.

With removal of floor of mouth, tonsils and glands—13 cases; 9 recoveries and 4 deaths.

Preceded by laryngotomy and tracheotomy—9 cases; 7 recoveries, 2 deaths.

Excision below the jaw—9 cases; 2 recoveries and 7 deaths.

Division of jaw or removal of portion of jaw—7 cases; 3 recoveries and 4 deaths.

These figures at once strike us as presenting most favorable results in the simple removal of the tongue, and an unusual mortality in the limited number in which the removal was effected

from the neck or by division of the jaw. These latter cases probably belong to the more desperate ones.

The results are stated to be that in 61 cases where positive evidence was obtained, 15 patients survived the operation one year; 4, two years; 2, three years; 4, five years, and one, six years. Twenty-six cases, therefore, were living more than a year after the operation. This is the best result yet published by any authority.

On the value of Whitehead's operation Treves says: "There can be no question," but advises the preliminary ligature of the linguals as facilitating the removal by preventing all hemorrhage, and recommends either Coleman's or Mason's gag.

Jacobson, who believes that it is of great advantage to leave half of the tongue where possible, commences the Whitehead operation by splitting that organ down the raphé with a sharp-pointed bistoury and further urges the advantages of preliminary tracheotomy, but condemns the ligature of the sub-lingual arteries. Mr. Treves reports in 34 cases of entire removal of the tongue with scissors and preliminary ligature of both lingual arteries, that he has had one death from pneumonia, one from pyæmia, and a third patient with aortic and mitral disease, died shortly after the operation.

The only *ecraseur* operation which I shall describe is the one suggested by Morant Baker, and the account is taken from Heath's Dictionary. "After the introduction of a suitable gag, and the removal of any sharp or jagged teeth which might be in the way of the operator, two threads are passed through the tongue about an inch behind the tip, and half an inch from the median line. The tongue now being drawn upward and forward the frænum and as far as may seem necessary, some of the muscular attachments of the tongue to the lower jaw in front are now snipped through, as advised by Sir James Paget, with strong, blunt-pointed scissors, and the scissors are then run along the floor of the mouth at the side beneath the mucous membrane as far back as may seem requisite, keeping close to the lower jaw both for the avoidance of hemorrhage and for the sake of keeping clear of the disease. The operator now with his forefinger clears the tongue in front and at the side, and drawing it well forward again and giving, one thread to his assistant, while

he holds the other himself he cuts along the middle line of the tongue from the tip backwards and further along the mucous membrane. On withdrawing the knife the finger is again introduced and it will be found quite easy to complete with it the median division of the tongue by a little tearing or splitting into two halves.

The only part which cannot be thus torn is the mucous membrane of the dorsum. Hence the advice to divide this with the knife as far as may seem necessary for getting beyond the level of the disease. The ecraseur is now slipped over the diseased half of the tongue. This of course is the most important part of the operation. Any want of care in this stage being shown by the narrow margin of healthy tissue, or by none at all, left attached to the diseased mass. The insertion of one or two curved needles well behind the disease before the application of the ecraseur in order to insure the division in healthy tissue is advisable, but for the reasons previously given must not be considered a sufficient safeguard in absence of free separation of the tongue's attachments in front and at the sides. When one-half of the tongue is removed the process is repeated on the other. "An ecraseur curved on the flat armed with strong whip cord is used. Where there is difficulty in placing the cord behind the disease the cheek may be split with advantage. Commonly the main vessels and some other tissue, perhaps nerve fibres, are pulled through the end of the ecraseur after the softer tissues of the tongue have been cut." These may be secured by double ligature and then cut. After this glands should be searched for and removed, either from the floor of the mouth or by an external incision. If hæmorrhage should occur Heath's method of controlling it has been found serviceable.

In the after treatment iodoform in powder is applied to the cut surface and removed when the wound becomes foul, small pieces of ice are kept in the mouth and mouth washes constantly used, and in almost all cases the patient is fed with a tube and funnel. When necessary, nutritive enemata are resorted to. Baker reports 40 cases with 5 deaths.

In the above operation the ecraseur is only used to cut through the tissue of the tongue after this organ has been fully freed by scissors from the floor of the mouth.

There are several steps in the method advocated by Baker which have proved important additions to the operative technique of removal of the tongue. When the tongue is to be split into lateral halves he has shown the advantage of two threads passed through the organ behind the tip, one on either side of the median line, over the single thread generally used.

His method of splitting the tongue by cutting through the mucous membrane as far back as necessary on the dorsum and then tearing through the raphé avoids all hemorrhage and is a great improvement over division by the scissors or knife.

No statistics based on a large number of cases operated on by Baker's method have been published, but it seems to have been largely practised and to have met with general approval.

Kocher's operation has received the commendation of most of the later writers for cases in which the floor of the mouth and sub-maxillary and cervical glands are involved, though it apparently has not been largely practised as being too serious an operation in cases in which the growth is confined to the tongue. Kocher commences his operation by a tracheotomy, and "fills the fauces with a sponge wrung out of carbolic acid and secured by a string." The description of the operation is taken from Butlin. "The first incision is made along the anterior border of the sterno-cleido mastoid muscle commencing a little below the tip of the ear. From the first a second incision is made from the middle of the sterno-mastoid muscle to the hyoid bone and along the anterior border of the digastric to the jaw. The flap is turned up on the cheek and the facial artery and vein and the lingual artery are tied. The sub-maxillary fossa is then completely cleared out, commencing from behind; the lymphatic glands are all removed, and even the sub-maxillary and sub-lingual glands, if the disease lies so near as to affect them. The mucous membrane is now divided along the lower jaw and as much as is necessary of the mylo-hyoid muscle is separated from the bone, the tongue is drawn down through the opening, is exposed with great ease and is removed either in part or in whole with scissors or the galvano-cautery. The galvano cautery is preferred by Kocher on account of the less liability of oozing after it has been employed. If the whole tongue is removed the lingual artery of the opposite side must

be ligatured through a separate incision. "If the operation is great the external wound is not to be closed with suture." The tracheotomy canula is left in and allowed to lie loose in the trachea as usual after tracheotomy. In order that the wound shall not in the slightest measure be infiltrated by the discharges the skin-flaps are fixed back with sutures and the entire cavity from the entrance of the wound right back into the mouth and pharynx is plugged with a tampon of gauze soaked in a solution of carbolic acid of 5 per cent., but before so strong a solution of carbolic acid is applied directly to the mucous membrane of the mouth the tampon is just washed over with water. The sponge or gauze lies immediately on the epiglottis or root of the tongue, and fills the bottom of the wound as far as it is covered with mucous membrane. The whole operation is done under the carbolic spray, the patient may be fed partly by the rectum, but feeding is accomplished chiefly when the dressings are changed. "This is done twice a day under the spray and before a fresh dressing is applied. Nourishment is given through a tube introduced into the stomach." In fourteen cases thus operated on there was only one death. Kocher's operation is indicated when the floor of the mouth is extensively involved or where the glands beneath the jaw are enlarged. It not only enables the surgeon to fully clear out the sub-maxillary space but secures the removal of all the tissues which lie between the primary seat of disease and the infected glands, the importance of which as a source of future danger has been pointed out by Verneuil. At the present day the spray must be regarded as superfluous, and the preliminary tracheotomy is probably unnecessary.

The extraordinary success which has followed Volkmann's method of operation as recently reported by Krause renders it desirable to describe the special procedure which has been adopted by this surgeon. In 91 cases of tongue cancer which were operated on there were only two deaths directly attributable to the operation. Tracheotomy and tamponade are discarded and splitting of the cheek considered useless. The following account of the two methods adopted is taken from the Annual 1890, "If the tongue can be drawn beyond the dental arch a resection is made by means of a knife or scissors, while the patient is seated upright

in a chair so that the blood flows away from the pharynx and there is no danger of its being drawn into the lungs. After bleeding is checked the mucous membrane can at once be brought together, or if there is a long strip of healthy tongue left this can be brought around so that a short but broad organ is left. If, however, the carcinoma extends so far posteriorly that strong traction is not sufficient to bring it near the dental arch, or if it has involved the floor of the mouth or tonsils, then the parts can be best exposed by dividing laterally the submaxillary bone. The patient is upon a table in an almost sitting posture, a traction thread is passed through the tongue and the latter is drawn forcibly forward. The lower canine or first molar tooth is then drawn, after which an incision is carried directly downward from the corner of the mouth to the larynx dividing the periosteum of the lower jaw, but made more superficial in the neck. The periosteum on the lower surface of the lower jaw is now pushed aside sufficiently to allow a broad iron lever to be passed upward until it rests upon and protects the upper lip. The jaw is divided upon this lever by a thin broad-bladed amputation saw, cutting obliquely backward, a strong resection hook is placed in each opening of the exposed intra-maxillary canal, the two portions of bone are drawn forcibly apart and the soft parts of the mouth are divided on a line of the first incision. Sufficient room is given for readily securing all bleeding vessels. The palato-glossal fold is divided and a drainage tube the size of the little finger placed in the tonsillar fossa and curved to the lower portion of the neck incision." Thirty-five cases gave one death due to pneumonia. "The cut surfaces are covered by mucous membrane and the bone wired. The patient retains a half reclining posture and is fed on liquid diet by means of a long glass tube extending far back into the mouth, which is irrigated after each meal with a three per cent. boracic acid solution. One case was living after six years—the average of life was about one year. Of thirty-seven partial excisions three have survived without relapse for over three years. Any attempt at tabulating and comparing the results obtained by different operators must be evidently unsatisfactory and unreliable. The cases differ so much in severity and in the immediate danger, and operators still differ so much in their views of the necessary extent of the operation indicated,

that a standard of comparison is impossible. Between the partial excisions of Hutchinson and the case reported by Whitehead in which the entire sterno-mastoid muscle and jugular vein were removed and the whole extent of the carotid laid bare in order to fully remove all the glands involved there is so much dissimilarity that the results cannot be judged together. Mr. Treves' estimate that the immediate mortality is now about ten per cent. may be considered as nearly correct and shows a marked improvement in the recent operations over earlier experience. There is evidence to show that the operation of removal by scissors is growing more and more popular while the *ecraseur* is certainly losing ground. Mr. Butlin writing in 1885 gives his preference for Baker's method because he had not seen Whitehead's operation often performed. During the last five years St. Bartholomew's Hospital reports (Mr. Butlin's Hospital) show that the whole tongue has been removed by scissors six times, and the lateral half by the same method twenty-one times during the last five years. During the same time the *ecraseur* was used in seven cases for removal of half of the tongue, and seven times for removal of the whole. In 1891 the *ecraseur* is reported as being used only once in ten cases. In a table of fatal cases of removal of the tongue a very large proportion will be found due to septic pneumonia, induced undoubtedly by the escape of blood into the trachea at the time of operation, or from some of the subsequent discharges from the wound in the mouth reaching the lungs. Cellulitis of the neck, collapse and hemorrhage, pyæmia and septicæmia are all causes of death. The great frequency with which the lungs become involved has induced different operators to avoid all possible loss of blood at the time of operation—indeed, hemorrhage in these cases is serious not from its amount but because it obscures the field of work and from the danger of blood reaching the trachea. The history of the operation is a history of efforts to avoid these dangers and in the after treatment to avoid the danger of foul and decomposed discharges developing in the mouth. The three great factors in the after treatment are summed up by Treves as follows:

First. —Let the patient be well fed.

Second.—Let all discharges escape from the mouth.

Third. —Keep the cavity of the mouth clean and sweet.

The first of these is now generally admitted, and if the patient can swallow sufficient food the mouth is the best channel, a tube being only exceptionally needed for the first few days,—if necessary, nutrient enemata may be employed. The second of these conditions is met differently by different operators. The great advantage of the sitting or half-raised posture is now largely recognized, and the very great disadvantage of continued recumbency after the operation enforced. Whitehead encourages the patient to get up on the second day and Treves approves of the same plan. Some operators depend largely upon a drainage tube whether the mouth has been opened from the neck or not. In order to keep the mouth clean and sweet the most various plans and greatest variety of washes have been adopted. Some depend upon frequent syringing, while others prefer constant gargling. Permanganate of potash, carbolic acid, sublimate solution, boracic acid and spirits and water have all been used and strongly commended. Billroth attempts to prevent contamination by the careful packing with iodoform gauze. This method does not seem to have found favor with English surgeons. Butlin lost a patient with septic pneumonia and Whitehead is reported by Treves to have had the dressing swallowed in one case. A very large proportion of operators, however, rely largely upon iodoform frequently dusted upon the wound. In this connection the styptic iodoform solution of Whitehead should be mentioned. The important thing seems to be the frequent removal of the discharges from the mouth and for this purpose there is great advantage in having the patient up and out of bed. There remains to be considered the best palliative treatment where operation is not indicated, or where the patient refuse surgical interference. Pain is the first symptom to be considered. It is generally present in a marked degree. Butlin approves of the application of a powder of iodoform, one grain, morphine one-six to one-half grain, and borax, three grains, applied directly to the painful spot. A number of authors mention the same application, but apparently without personal experience. The powder is to be reapplied at short intervals. Cocaine has naturally come into use either by application to the surface of the sore, or by injection around the border of the ulcer by a hypodermic syringe. The danger of establishing the cocaine habit

must not be overlooked. One such case has come under my own observation. A lady for a painful ulcer under the right side of the tongue began the use of cocaine, and when seen was using 30 grains a day injecting a solution of the drug by means of a hypodermic syringe into the borders of the ulcer. The habit was confirmed and her condition distressing. The effect upon the local sore was no less disastrous; an enormous ulcer surrounded by walls of sloughing tissue had undermined two-thirds of the tongue whose movement was so impaired that swallowing was difficult. A dangerous amount of œdema of the glottis existed. The patient was under observation a short time and the character of the disease could not be definitely determined. Whitehead has offered his protest against the insufficient doses of morphine often given, and gives the details of a case where the amount finally reached 30 grains a day with evident comfort and with no disturbance of the mental power. Since the first performance of section of the lingual nerve by Hilton it has been constantly recommended by different writers for the relief of severe pain in the tongue, either from neuralgia or cancer. Stretching of the same nerve was first suggested by Le Dentu. In a case of recurrent cancer in which the anterior half of the right side of the tongue had been removed I exposed the lingual nerve and stretched it until it broke. Relief of pain at first was complete but lasted only about two weeks and was then as bad as ever. The operation is easy of performance and a section of the nerve should certainly be removed where the pain is severe,—relief for even a few weeks is well purchased at the cost of so simple an operation. Section of the nerve is likely to prove most efficient when the growth is situated well forward on the side of the tongue. Extreme and distressing salivation is said to be at once controlled by a section of the lingual nerve.

For the relief of salivation and fetor various mouth washes have been advocated—iodoform, salicylic acid, and the vapor of creosote have met with most favor. In the majority of cases of cancer of the tongue a sufficient amount of liquid nourishment can be taken without much discomfort, but in some cases where the least movement is most painful it is found impossible to administer the necessary food. In such cases great and sometimes complete alleviation of the suffering in swallowing can be ob-

tained by freely painting the sore and fauces with cocaine just before the administration of food, or a soft rubber tube may be passed into the œsophagus—a simple manœuvre that the patient can easily learn to accomplish. The food should be of the blandest character and free from pepper and spice and should be in the form of minced meats and jellies or fluid.

The following conclusion I consider justified by the foregoing discussion :

First.—Sufficient experience has been accumulated to show that the removal of cancer of the tongue prolongs life and adds to the comfort of the patient and further affords a reasonable hope of a permanent cure.

Second.—All operations should be preceded by an effort to secure thorough disinfection of the mouth and teeth.

Third.—In the treatment of continued ulcers and sores on the tongue caustics are to be avoided and all sources of irritation removed.

Fourth.—Persistent sores on the tongue should be freely removed by knife or scissors if they resist treatment.

Fifth.—When the disease is confined to the tongue Whitehead's operation should be employed for its removal.

Sixth.—In this operation the advantage of preliminary ligature of the lingual artery is not definitely settled but the weight of authority is against its necessity.

Seventh.—The advantage of leaving one-half the tongue in unilateral disease must be considered undetermined, but the weight of positive experience is in its favor. In splitting the tongue into lateral halves Baker's method of tearing through the raphé should always be employed.

Eighth.—A preliminary tracheotomy adds an unnecessary element of danger in the removal of the tongue in ordinary cases.

Ninth.—When the floor of the mouth has become involved or the glands are enlarged Kocher's operation should be performed, omitting the spray and preliminary tracheotomy.

Tenth.—Removal of the glands by a separate incision after the removal of the tongue must be considered insufficient.

Eleventh.—Volkman's method still rests on individual experience. Its just value cannot be determined until it has been subjected to trial by a number of surgeons.

Twelfth.—Thorough and complete removal should be the aim of all operation, whether for limited or extensive diseases.

Thirteenth.—By whatever method the tongue is removed the patient should be up and out of bed at the earliest possible moment, and should be generously fed.